

# Technology For All

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## Introduction

One hundred years ago, a discussion of national academic standards for the subject areas taught in public schools would have been irrelevant. At that time, the disciplinary departmentalization by institutions of higher education validated the movement to make language arts, mathematics, science, foreign language and history essential parts of schooling. Throughout the twentieth century, these core subjects's have endured to become powerfully situated at the center of the dominant global educational paradigm.

A century later, in the current context of national education reform, educators, parents and students are questioning what students should be expected to know and be able to do through K-12 education. What should be essential education for all pupils regardless of their socio-economic background, gender or heritage?

We have developed from an agricultural to an industrial to a technological age and technology has become a predominant and influential force in our society. Today, the concepts, processes and products of technological innovation surround Americans. General technological literacy and capability are considered critical to the future of our country is businesses, government and quality of life. The study of technology is an imperative for all pupils in the next millennium.

## Technology as a School Discipline

Technology education is a relatively new subject in the public school curriculum. While references to technology as a subject matter for schools can be found in U.S. education literature from the 1930s, only in the past decade has a discernible

technology education movement gained momentum. Because of its newness and elusive nature as a quantifiable discipline, the study of technology is often misunderstood and confused with other structures of knowledge. In its simplest terms, technology is the study of our human created world, as contrasted to science, which is a study of our natural world.

Technology draws its intellectual domain and modes of inquiry along the dynamic continuum that starts with human wants and needs and end sin the satisfaction of those wants and needs. It includes such human capabilities as designing, inventing, innovating, practical-problem solving, producing, communicating and transporting. Technology should not be confused with "technical" since the former is very broad in the scope of solving practical problems, and the latter is specific and involves in-depth skills and competencies to solve these problems. Technology education is the school subject that teaches what students should know about, be able to successfully do and value in technology. There is a marked difference between the terms "technology education" and "educational technology". Technology education is the evolving discipline that teaches about technology as a subject area and educational technology is the support area in education that uses technology as a means to improve the process of teaching. Educational technology more commonly deals with the use of technology through the use of hardware, devices and equipment to enhance the educational endeavor.

One of the essential means whereby we humans evolved out of our ancestral past has been because technology has been used as a powerful force to alter the human condition. Technology has both positive and negative capabilities. Unlike science, technology has social consequences to its applications and solutions. Technology can solve problems, as well as create them. Technology influences our society and culture by changing our lives and our environment. Since education is an important component of our culture, the study of technology must be an essential part of our educational core or basic subject requirements in grades K-12. Technology education can provide a wholesome continuum of educational benefits to all students from awareness to literacy to capability. It can lead to such rewarding careers as engineering, architecture and many areas of human innovation and problem solving.

### The Importance of Standards for an Emerging Discipline

The National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) in the United States are funding an effort to create national standards for technology education in grades K-12. The effort is spearheaded by the

International Technology Education Association (ITEA) and is called "Technology for All Americans." The ultimate goal is to offer the technology education profession a clear vision for what it means to be technologically literate. The standards should present what all students should know about, value and be able to do in technology. The standards will provide criteria for assessing curriculum content in technology education (K-4, 5-8, 9-12), teaching and evaluation, which can then provide opportunities for all students to learn technology in ways that are more consistent and coordinated across all levels of the education system.

When the technology education standards refers to all students, it means that the standards apply to every student regardless of his or her background (gender, ethnicity, economic condition), circumstances or ambition. The term national means a nationwide consensus or agreement, not a federal mandate. Most certainly, the Standards for Technology Education will not define a national curriculum, nor will they suggest a form of national standardization of an actual curriculum.

The use of standards to improve the quality of technology education will have a positive impact on the student, school, community and nation. The students should be the first to benefit through enhancement of their technological literacy. Use of the standards should enhance the overall quality of the curriculum content, the instructional program, the teaching methods, the physical environment of technology education laboratories, the preparation and quality of teachers and the safety program, among other areas. Classroom and laboratory teachers will be able to assess their curriculum programs against a set of nationally developed and validated standards. After the assessment is made, curriculum and program strengths should be enhanced.

The school system should also benefit from having technology education standards. The standards should mandate that effective, open communication be established with all elements in the school system, especially those in technology, science and mathematics and then used consistently by technology education faculty and staff. Also, as a result of the standards, non-technology educators, students and parents will be informed about the technology education program, thereby generating opportunities for support, guidance and interdisciplinary educational activities.

## Developing Standards for the School Subject Technology

Unlike the national standards efforts of traditional disciplines, there is not yet consensus on what the "intellectual domain" for technology is. Technology is a new discipline and there is debate on its definition, purpose and scope. Therefore, the standards effort will begin with research and development of the rationale and

content structure for technology. This is vital to the success of developing curriculum and program standards for technology education. In researching other standards, the Technology for All Americans Project has found that there are some 17 school disciplines in the United States that have developed or are currently developing national standards. There appears to be little consistency in the processes used to develop these standards. Listed below are the curriculum areas that have completed their standards or are in the process of working on them:

<b>Completed</b>	<b>In Progress</b>	<b>In Revision</b>
Mathematics (1989)	Economics	History
Arts (1994)	English	
Civics and Government (1994)	Global Education	
Geography (1994)	Pacesetter	
Physical Education (1994)	Technology	
Social Studies (1994)		
Business (1995)		
New Standards Project (1995)		
Foreign Languages (1996)		
Science (NRC) (1996)		

Some of these standards are content focused while others are "process" focused. Most of the standards have some type of grade divisions such as K-4, 5-8 and 9-12 for curriculum content organization and assessment purposes. The majority of the 17 standards define their discipline in detail, as well as provide a rationale and structure (an articulated scope and sequence of what is to be taught and when it is to be taught). Most standards present some type of vision and goals for what they hope to accomplish with their standards.

The Technology for All Americans Project is divided into two phases. The goals of the two phases are as follows:

- Phase I – The Project is developing a long-term vision for what should be the intellectual domain for technology education. This has involved researching and developing a rationale and structure for future technology education content. These visions will interface with science, mathematics, engineering and other disciplines.

Research has been performed on the accomplishments of standards development in other disciplines. This work builds upon processes including previous philosophical efforts, which provided a direction for technology education in the 1980s and 1990s. Phase I will culminate with publications presenting the Rationale and Structure for Technology Education.

The profession was asked to provide input to the development of the Rationale and Structure for Technology Education in Phase I and in the National Standards for Technology Education in Phase II for the purpose of obtaining consensus. Specifically, consensus workshops were conducted at seven NASA centers in the United States on the Rationale and Structure for Technology Education, during the summer of 1995. In the fall of 1995 during Phase I, the staff conducted consensus building workshops, both at regional and state technology education association meetings in the United States, and at regional and state science, mathematics and engineering association meetings in the United States. In addition, consensus-building activities were conducted through regular mail and electronic mail. Based on the input received at these consensus-building activities, a final editing of the rationale and structure will take place in 1996.

The Technology for All Americans project has a National Commission that serves in an advisory capacity to the project staff. The 24-member Commission functions independently of both the project and ITEA. A six member writing team has been formed from the National Commission. The Commission is composed of persons who are eminently aware of the need for a technologically literate society. Members represent the fields of engineering, science, mathematics, the humanities, education, government, professional associations and industry. They serve as a vital resource of experts who are knowledgeable in technology and its proper interface with science, mathematics, engineering and education. Several Commission members have been involved in the development of standards in other disciplines.

Funding was received for Phase I and a new proposal has been written to seek funding for Phase II in the near future.

Phase II – Will develop, validate and gain national consensus on standards for curriculum content in technology education for all students, with regard to background, future aspirations and prior interest in technology at the following grade levels: K-4, 5-8 and 9-12. Standards will be created for student assessment. In addition,

standards for technology education programs (K-12) will be developed.

The Technology for All Americans Project also hopes to create standards for teacher preparation. Included in the standards will be all aspects of technology, as well as the relationships with other allied disciplines such as science, mathematics and engineering.

Phase II writing teams will include technology teachers, supervisors and teacher educators, as well as representatives from other disciplines such as science, mathematics and engineering. Once the first draft of the standards is produced, the consensus building process will begin. The first draft standards document will be circulated through the National Commission and to selected practitioners and leaders in technology education for feedback. The Commission will then meet to discuss the first draft of the documents. Later, the writing teams will meet again to synthesize the input given on the first draft and produce the second draft of the standards. The second draft of the curriculum and program standards will be circulated to a larger percentage of the profession and to the science, mathematics and engineering community for their reaction and recommendations. The staff will then meet with members of the writing teams to review the input on the second draft and then use this input to generate the third draft of the standards. After the third draft is produced, the staff will conduct regional consensus hearings throughout the United States.

Input will also be received from the profession at professional conferences. The staff will synthesize the input from the regional hearings, in addition to the input received at other hearings, in preparation for the writing of the final draft of the standards. As a result, hundreds of educators will have given their input into the standards in an effort to gain consensus.

## Summary

Today, there are very diverse offerings in the technology education profession ranging from basic programs reflective of the early manual arts to state-of-the-art technology education programs that reflect technology based curriculum activities. It is hoped that the standards will provide a means for improving the quantity and quality of technology education programs. Technology education reform is a systemic process in which we all have roles and responsibilities to create a meaningful and productive change for the future.

Understanding the creation and development of educational standards is important in this age of accountability. National standards provide criteria by which judgments can be made at the national, regional, state, provincial or local levels on the quality of education. Most standards are based on a "vision" of what should be and they provide concrete expressions of national goals and directions for school disciplines.

The Technology for All Americans Project has been created by the International Technology Education Association and funded by two very respected federal agencies in the United States, the National Science Foundation and the National Aeronautics and Space Administration, to develop national standards for the school subject that teaches about technology. The Project is completing its first phase which is the development of a plan for the standards that specifically addresses what each pupil should know about, be able to do and value in technology. The second phase, hopefully to be funded after the first phase, will focus on creating the standards (grades K-4, 5-8 and 9-12), as well as teacher enhancement and preparation standards, program standards and student assessment standards.

The long-range goal for Americans schools is to provide a more technologically literate and capable citizenry who will be productive and socially responsible in the future.